NISTTech

METHOD AND APPARATUS FOR ARTIFICIAL WEATHERING

High intensity, uniform UV radiation for accelerated weathering experiments

Description

This unique ultraviolet (UV) weathering device, called the SPHERE (Simulated Photodegradation via High Energy Radiant Emission), is used to artificially accelerate the degradation of polymeric materials. The NIST SPHERE generates laboratory weathering results that can be linked to field results for accurate service life predictions of polymeric materials. It provides a source of high intensity (≈ 22 suns), highly uniform (≥ 95 %), collimated UV radiation for accelerated weathering experiments on a wide variety of polymeric materials such as coatings, sealants, composites, roofing and siding components.

Use the SPHERE in any photogenic application including agriculture (e.g., the effect of ultraviolet radiation on the growth of fungi), biological (e.g., photosynthesis), or medical (e.g., sunscreen efficiency, skin cancer). The SPHERE couples 28 specimen chambers in which temperature and relative humidity can be independently and precisely controlled over a wide range and over long exposure periods. Four additional chambers have the additional capability of mechanical loading. The NIST SPHERE can simultaneously expose more than 550 specimens, each in its own unique and extremely well-controlled exposure environment.

Images

Scientist working on the SPHERE. Credit: NIST

Applications

- **Agriculture**
  Practical tool for observing the effects of ultraviolet radiation on plants and crop harvests
- **Biological research**
  Helps scientists to better understand the processes of photosynthesis in plants
- **Construction materials testing**
  Exposes materials to high rates of ultraviolet radiation so scientists can study the impact of sunlight on the degradation of materials typically used outdoors
- **Medical studies**
  Enables highly controlled studies of sunscreen and skin cancer research

Advantages

- **Highly customizable specimen chambers**
  Each of the 28 specimen chambers has independent temperature and relative humidity controls
- **Uniformity**
  Uniform UV exposure around the entire 2 meter diameter SPHERE
- **Multitasking**
  Enables testing of up to 550 different specimens at one time

Abstract

A method and apparatus for irradiating a specimen with a beam of radiation are provided. The method comprises the steps of providing an integrating sphere, a radiation source radiatively communicating with the sphere, and a specimen, the integrating sphere radiatively communicating with the specimen through an aperture in the sphere. The apparatus comprises a radiation source, an integrating sphere in radiative communication with the radiation source, and a specimen holder in radiative communication with the integrating sphere. The disclosed apparatus and method allow the irradiance of a beam of radiation impinging on the specimen to be maintained at a uniform level across the width of the beam to allow quantitative specimen evaluation.

Inventors

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Citations

1. J. Chin, E. Byrd, N. Embree, J. Garver, B. Dickens, T. Finn, and J. Martin. Accelerated UV Weathering Device Based on Integrating Sphere Techology. Review of Scientific Instruments, 75(11), 4951-4959, 2004.

Related Items

- Article: NIST and French Lab to Study Weathering of Advanced Composited for Bridges and Piers
- Article: Everyday is SUNday Inside the Sphere
- Use of Integrating Spheres as Ultraviolet Radiation Sources for Artificial Weathering of Polymers

References

- U.S. Patent # 6,626,052 and PCT issued 09-30-2003, expires 08/02/2019
- Docket: 96-013

Status of Availability

This invention is available for licensing exclusively or non-exclusively in any field of use.

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